FISH & RICHARDSON P.C.

PRE-APPEAL BRIEF REQUEST FOR REVIEW	Docket Number:
	MP0284 / 13361-0048001

	Application Number	Filed
CERTIFICATE OF TRANSMISSION BY EFS-WEB FILING	10/647,163	August 21, 2003
I hereby certify that this paper was filed with the Patent and Trademark Office using the EFS-WEB system.	First Named Inventor	
	Hui-Ling Lou et al.	
September 9, 2008	Art Unit	Examiner
Date of Deposit		
/Mae Pattison/	2616	Hanh N. Nguyen
Signature		
Mae Pattison		
Typed or Printed Name of Person Signing Certificate		

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a Notice of Appeal.

The review is requested for the reason(s) stated on the attached sheet(s).
      Note: No more than five (5) pages may be provided.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest.
    See 37 CFR 3.71. Statement under 37 CFR 3.73(b)
    is enclosed. (Form PTO/SB/96)

☒ attorney or agent of record 58,720
                    (Reg. No.)

☐ attorney or agent acting under 37 CFR 1.34.
    Registration number if acting under 37 CFR 1.34

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September 9, 2008
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NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ Total of one form is submitted.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Hui-Ling Lou et al.	Art Unit	: 2616
Serial No.	: 10/647,163	Examiner	: Hanh Nguyen
Filed	: August 21, 2003	Conf. No.	: 1606
Title	: LOW COMPLEXITY CHANNEL ESTIMATION FOR ORTHOGONAL FREQUENCY DIVISION MODULATION SYSTEMS		

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PRE-APPEAL BRIEF REQUEST FOR REVIEW

The brief is in response to legal and factual deficiencies in the final Office Action mailed June 9, 2008.

Claims 1-3, 5-27, 29-51, 53-75, and 77-104 are currently pending, of which claims 1, 25, 49, and 73 are independent. The Examiner rejected claims 1-3, 5-27, 29-51, 53-75, and 77-104 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Pat. No. 6,996,195 B2 ("Kadous") in view of U.S. Pat. No. 7,099,413 B2 ("Chuang"). The Examiner further rejected claim 73 under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter.

I.   **The cited art fails to teach or suggest, at least, <u>receiving a preamble that includes two or more training sequences.</u>**

Claim 1 is directed to a method that includes receiving a preamble across a channel, the preamble including two or more training sequences, performing a Fourier transform of the training sequences, and deriving initial channel estimates in the frequency domain with the received preamble and a stored preamble. The method further includes receiving data symbols across the channel, demodulating and decoding the data symbols, and updating the channel estimate using the demodulated and decoded data symbols.

The Examiner suggests that Kadous and Chuang meet the limitations of claim 1. The Examiner states that Kadous teaches all limitations of claim 1 with the exception of Applicants' claimed step of updating the channel estimate, which the Examiner acknowledges that Kadous

fails to teach or suggest. However, he suggests that Chuang shows this limitation. Applicants respectfully disagree. Applicants respectfully assert that Kadous fails to teach or suggest, at least, <u>receiving a preamble that includes two or more training sequences</u>. Chuang fails to correct for this deficiency.

Kadous discloses a communication system that uses least squares estimation techniques to estimate channels. (Abstract). Kadous' system includes a receiver that receives a signal over a radio channel and converts the signal from the time to frequency domain. (Fig. 1; col. 4, line 52-col. 5, line 2). The frequency-domain signal is input to a phase corrector and a channel estimator. (Fig. 1; col. 5, lines 2-9). A buffer receives a single training sequence from the frequency domain signal and stores that training sequence. (Fig. 2, no. 22; col. 5, lines 14-17). A least squares estimator divides the signal to determine a least squares channel estimate, and a coefficient interpolator and channel estimator then multiply the estimate by a corresponding channel interpolation coefficient to determine a final estimate for each channel. (Col. 5, lines 16-19, 25-28).

Kadous fails to teach or suggest receiving a preamble that includes two or more training sequences. In the previous Response, Applicants explained that Kadous does not show a preamble that includes two or more training sequences. Instead, Kadous shows that one training sequence – and only one – is extracted from a received radio signal.[1] The Examiner responds to Applicants' arguments by stating that "in Kadous, fig. 5, from the received signal r(t) inputted into FFT (step 20), the training sequences are extracted from preamble of data burst (see step 22 and col. 9, steps 20, 22, lines 55-60)." However, the cited passage and figure both demonstrate that only a *single* training sequence is extracted from the signal preamble. In column 9, Kadous states that "the training *sequence* [singular] is extracted from the preamble" and proceeds to describe dividing "the received training *sequence* [singular] by the exact training sequence." (Col. 9, lines 57-60). Similarly, element 22 of Fig. 5 reads "extract training *sequence* [singular]." The Examiner's remarks actually support Applicants' position that Kadous teaches

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[1] As Applicants have previously explained, Kadous' training sequences [A, B] and [C, D] are matrix representations of training sequences transmitted from two separate antennas, Tx1 and Tx2. (Col. 5, lines 39-49). These training sequences are not included within the same preamble, but correspond to two separate signals transmitted from the two antennas Tx1 and Tx2.

receiving a preamble including only a single training sequence, not two or more training sequences.

Chuang, which shows a method of channel estimation based on iterative forward- and backward-processing, fails to correct for the deficiencies in Kadous. Applicants respectfully assert that the Examiner concedes as much, in that he relies on Chuang only as showing the limitation of updating the channel estimate using the demodulated and decoded data symbols and has additionally failed to augment this reliance in response to Applicants' previous arguments. Therefore, Applicants respectfully submit that claim 1, as well as claims 26-27, 29-48, and 99-100, which depend from claim 1, are allowable over the combination of Kadous and Chuang for at least these reasons.

Claim 25 is directed to a communication device including a receiver, a Fourier transform module that performs a Fourier transform of two or more training sequences received in a preamble in a frequency domain, and a channel estimator that derives initial channel estimates in the frequency domain using the received preamble and a stored preamble. The communication devices further includes a decoder to demodulate and decode received data symbols and an update module that updates the channel estimate using the demodulated and decoded data symbols. Applicants respectfully submit that claim 25, as well as claims 26-27, 29-48, and 99-100, which depend from claim 25, are allowable for at least the reasons given above with respect to claim 1.

Claim 49 is directed to a communication device including means for receiving preambles and data symbols, means for performing a Fourier transform of two or more training sequences received in a preamble, and means for deriving initial channel estimates in the frequency domain using the received preamble and a stored preamble. The communication device further includes means for demodulating and decoding received data symbols and means for updating the channel estimate using the demodulated and decoded data symbols. Applicants respectfully submit that claim 49, as well as claims 50-51, 53-72, and 101-102, which depend from claim 49, are allowable for at least the reasons given above with respect to claim 1.

Claim 73 is directed to a computer program product that causes data processing apparatus to perform the steps of performing a Fourier transform of two or more training sequences received in a preamble across a channel, deriving initial channel estimates in the frequency

domain with the received preamble and a stored preamble, demodulating and decoding the data symbols received across the channel, and updating the channel estimate using the demodulated and decoded data symbols. Applicants respectfully submit that claim 73, as well as claims 74-75, 77-96, and 103-104, which depend from claim 25, are allowable for at least the reasons given above with respect to claim 1.

II.   The cited art fails to teach or suggest updating the channel estimate by performing operations <u>excluding multiplication operations</u>.

Claim 2 is also separately allowable for at least the following additional reasons. Claim 2 recites updating the channel estimate by performing operations on the demodulated and decoded data symbols, the operations excluding multiplication operations.

The Examiner states that "the limitation has been disclosed in claim 1 (See claim 1, Chuang et al. fig 1A, receiver 140)." However, nothing in Chuang's claim 1 or Fig. 1A suggests specifically excluding multiplication from the operations used to demodulate and decode data symbols. Indeed, the Examiner has not identified any such suggestion, even after Applicants pointed out the absence of such a suggestion in the previous Response. Kadous does not cure this deficiency. Therefore, Applicants respectfully submit that claim 2 is allowable over the combination of Chuang and Kadous for at least these additional reasons.

Claims 26, 50, and 74 recite limitations similar to those of claim 2 and are allowable for at least the additional reasons given above with respect to claim 2.

III.   Independent claim 73 is directed to statutory subject matter.

The Examiner rejected claim 73 under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter. The Examiner states that Applicants' claimed <u>information carrier</u> "is a tone/waveform/signal" to support this rejection. The Examiner further states that a computer program product is not described in Applicants' specification and requests Applicants to identify the specification support.

The originally-filed application included claims drawn to a computer program. The computer program claims recited steps that mirrored the steps of the method described and claimed in the specification. The output (or "product") of this originally-claimed computer

program is identical to the outcome of the method. Therefore, the description of the computer

program product is inherent to the description of the method outcome. Applicants respectfully

assert that the original specification provides sufficient support for the computer program

product claims for at least these reasons.

Additionally, it is settled Federal Circuit case law that a computer program product claim

is drawn to patentable subject matter so long as the program is embodied in a tangible medium.

See, e.g., In re Lowry, 32 F.3d 1579 (Fed. Cir. 1994). Even if the Examiner's interpretation of

the term "information carrier" is correct, which Applicants do not concede, this is irrelevant.

The issue, instead, is whether the claim as a whole is directed to patentable subject matter. *See,*

e.g., In re Alappat, 33 F.3d 1526, 1543-44 (Fed. Cir. 1994) (*citing Diamond v. Diehr*, 450 U.S.

175, 187 (1981)) ("A claim drawn to subject matter otherwise statutory does not become

nonstatutory simply because it uses a mathematical formula, computer program or digital

computer."). Therefore, Applicants respectfully submit that claim 73 – which recites a computer

program product, *tangibly embodied in an information carrier*, for obtaining a channel estimate

– is drawn to patentable subject matter.

For at least these reasons, Applicants respectfully request withdrawal of the additional

rejection of claim 73 and all claims depending from claim 73.

Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: September 9, 2008   /Christina Jordan/
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